

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: BTECH
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE

SEMESTER : II
SESSION : SP/2023

SUBJECT: CH101 CHEMISTRY

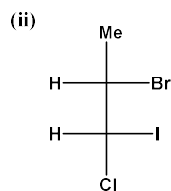
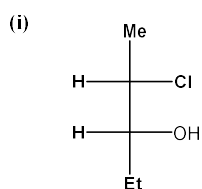
TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

		CO	BL
Q.1(a) Discuss radius-ratio rule along with its limitations.	[2]	1	2
Q.1(b) Estimate the ionic radius of Cs ⁺ . The lattice energy of CsCl is 633 kJ/mol. For CsCl the Madelung constant, M, is 1.763, and the Born exponent, n, is 10.7. The ionic radius of Cl ⁻ is known to be 1.81 Å.	[3]	1	3
Q.2(a) Show by means of a diagram how the pattern of d orbital splitting changes as an octahedral complex undergoes tetragonal distortion and eventually becomes a square planar complex.	[2]	1	2
Q.2(b) (i) Why transition metal complexes have higher measured lattice energy as compared to the normal metals and explain the reason for the hump. (ii) If the CFSE of [Co(H ₂ O) ₆] ²⁺ is -0.8 Δ _o , what spin state is it in?	[2+1]	1	2
Q.3(a) Apply selection rule (Laporte and Spin) for the electronic transition in [Mn(H ₂ O) ₆] ²⁺ and predict possible transitions.	[2]	1	3
Q.3(b) Show the formation of σ and π bonding and antibonding molecular orbitals due to overlap of 'p' orbitals with suitable diagram.	[3]	2	2
Q.4(a) Predict the hybridisation and shape of BF ₃ molecule.	[2]	2	2
Q.4(b) Find out the bond order and magnetism of O ₂ ⁺ , O ₂ ²⁻ and N ₂ ⁻ .	[3]	2	3
Q.5(a) Why in general boiling point of cis-isomers is higher compared to trans-isomers?	[2]	2	2
Q.5(b) Find out the R, S nomenclature of the following compounds.	[1.5+1.5]	2	3



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